MUHLENBERGIA JAIME-HINTONII (POACEAE: CHLORIDOIDEAE), A NEW SPECIES FROM NUEVO LEÓN, MEXICO

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ABSTRACT

Muhlenbergia jaime-hintonii P.M. Peterson & Valdés-Reyna, sp. nov., is described and illustrated. The new species occurs in gypsum soils in southern Nuevo León, Mexico between the municipalities of Aramberri and General Zaragoza. Based on anatomical and morphological features *Muhlenbergia jaime-hintonii* is placed in subgenus *Podosemum*, section *Epicampes*. The new species seems most closely allied with *Muhlenbergia pubigluma* but differs by its shorter culms (44–82 cm long), shorter truncate ligules (0.4–1.0 mm long) with ciliolate apices, shorter spikelets (1.5–2.1 mm long), shorter glumes (0.7–1.2 mm long), shorrer lemmas (1.5–2.0 mm long), shorter paleas (1.5–2.0 mm long), and shorter anthers (0.8–1.0 mm long).

RESUMEN

Se describe y se ilustra *Muhlenbergia jaime-hintonii* P.M. Peterson & Valdés-Reyna, sp. nov. Esta nueva especie se presenta en parte de las tierras gipsófilas en el sur del estado de Nuevo León, México, en los municipios de Aramberri y General Zaragoza. Basados en características anatómicas y morfológicas *Muhlenbergia jaime-hintonii* se ubica en el subgénero *Podosemum*, sección *Epicampes*. Esta nueva especie está fuertemente relacionada con *Muhlenbergia pubigluma* pero difiere de ella por sus cúlmenes más cortos (44–82 cm de largo), lígulas más cortas (0.4–1.0 mm de largo) rruncadas con ápices ciliolados, espiguillas más cortas (1.5–2.1 mm de largo), glumas más cortas (0.7–1.2 mm de largo), lemas más cortas (1.5–2.0 mm de largo), páleas más cortas (1.5–2.0 mm de largo), y anteras más cortas (0.8–1.0 mm de largo).

While working on a catalogue of the grasses of Northeastern México (Valdés-Reyna, Davila, & Carranza Pérez, in prep.) and while preparing a revision of the perennial *Muhlenbergia* for México (Peterson, in prep.), JVR suggested to PMP that a collection by Mr. Jaime Hinton from southern Nuevo León might represent an undescribed species. At first glance the lemmas of this

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specimen appeared to be 1-veined and the ligule appeared to be a line of hairs, both characteristics of *Sporobolus*. Two specimens (*Hinton 22698* & *Hinton 23766*) were previously sent to J.R. Reeder (ARIZ) who determined them to be *Sporobolus cryptandrus* (Torr.) A. Gray. However, upon closer inspection, the lemmas are usually 3-veined with faint lateral veins, these occasionally absent; and the ligule is very short with a membranous base and a truncate-ciliolate apex. The new species is clearly a member of the subfamily Chloridoideae, tribe Eragrostideae (Peterson et al. 1995, 1997). Therefore, we describe these specimens as a new species of *Muhlenbergia*, and name the species after the original collector, Jaime Hinton.

Muhlenbergia jaime-hintonii P.M. Peterson & Valdés-Reyna, sp. nov. **(Figs. 1, 2).** TYPE: MÉXICO. NUEVO LEÓN: Municipio General Zaragoza: La Joya, Cuesta Blanca, approximately 15 km S of Aramberri on road towards Zaragoza (23° 59' 37.1" N–99° 47' 38.7" W), 1345 m, 31 Oct 1998, *J. Valdés-Reyna & M. A. Carranza Pérez 2560* (HOLOTYPE: ANSM!; ISOTYPE: US!).

A *Muhlenbergia pubigluma* Swallen surculis extravaginalibus, rhizomatibus brevi-foliis, culmis 44–82 cm altis, ligulis 0.4–1 mm longis apicibus truncatis et ciliolatis, ramis inflorescentiae 0.5–6.0 cm longis, spiculis 1.5–2.1 mm longis, glumis 0.7–1.2 mm longis glabris, lemmatibus 1.5–2.0 mm longis leviter 3(1)-venis, paleis 1.5–2.0 mm longis, antheris 0.8–1.0 mm longis, recedit.

Loosely caespitose perennial with short, densely leafy rhizomes and extravaginal shoot initiation. Culms 44–82 cm tall, erect, compressed keeled near the base, densely white pubescence below the basal nodes, these hidden beneath the leafy sheaths, the hairs 0.8–1.3 mm long, upper nodes glabrous or puberulent; internodes puberulent below and mostly glabrous above. Sheaths 6–28 cm long, longer than the lower internode, puberulent to glabrous, stiff and brownish below, often curled; margins mostly smooth with a few short hairs near the summit. Ligules 0.4–1 mm long, membranous below; apex truncate, ciliolate. Blades 5–22 cm long, 1.8–5 mm wide, flat just above ligule to tightly conduplicate above, apically acuminate, somewhat stiff, pubescent above and glabrous below. Panicles 13–34 cm long, 0.7–7 cm wide, narrow to somewhat open, the ascending densely flowered branches tightly appressed or loosely spreading up to 40° from the culm axis; pedicels 0.5–2 mm long, ascending, scaberulous; inflorescence branches 0.5–6.5 cm long. Spikelets 1.5–2.1 mm long, appressed to branches, 1-flowered, reddish-gray. Glumes 0.7–1.2 mm long, oblong, shorter than the lemma, usually equal in length, faintly 1-veined, reddish, glabrous, scaberulous along the midvein; apex acute to obtuse, occasionally minutely erose. Lemmas 1.5–2.0 mm long, oblong to elliptic, unawned, faintly 3(1)-veined, greenish mottled with reddish areas; midvein, margins, and proximal 1/2 to 3/4 loosely to densely appressed pubescent to villous, often these hairs more numerous along the margins and midvein below, the hairs up to 0.5 mm long; apex

FIG. 1. *Muhlenbergia jaime-hintonii* (*Valdés-Reyna & Carranza Pérez 2560*). A. Habit. B. Sheath, ligule, and portion of a blade. C. Inflorescence. D. Secondary branch of inflorescence. E. Spikelet. F. Glumes. G. Lemma, dorsal view. H. Lemma, opened dorsal view. I. Lemma, lateral view. J. Palea. K. Palea with stamens, pistil, and lodicules. L. Stamens, pistil, and lodicules. Scale for C is shown in A; scale for F–L is shown in E.

acute, rarely minutely mucronate. Paleas 1.5–2.0 mm long, oblong, 2-veined, equal in length to the lemma, the proximal 2/3 to 3/4 densely appressed pubescent to villous between the veins and along the margins; apex acute to obtuse. Stamens 3; anthers 0.8–1.0 mm long, reddish at maturity, greenish when immature. Ovary 0.2 mm long; styles 2, separate, glabrous; stigmas 2, feathery, whitish. Caryopsis not seen.

Phenology.—Flowering in October through November.

Distribution.—*Muhlenbergia jaime-hintonii* is known only from southern Nuevo Leon between 1300–1850 m in the Municipio's Aramberri and General Zaragoza, and can be found growing in whitish, alkaline soils derived from gypsum with *Leucophyllum hintoniorum* G.L. Nesom, *Scutellaria lutilabia* T.M. Lane & G.L. Nesom, *Galium dempsterae* B.L. Turner, *Lobelia gypsophila* T.J. Ayers, *Geniostemon gypsophilum* B.L. Turner, *Callisia hintoniorum* B. L. Turner, *Agave striata* Zucc., and *Hechtia glomerata* Zucc.

Additional specimens examined: **MEXICO. Mpio. Aramberri:** Between La Escondida and Aramberri, 1425 m, 23 Oct 1993, *G.B. Hinton et al. 23707* (ANSM, US); San Francisco, 1835 m, 3 Sep 1993, *G.B. Hinton 22698* (ANSM, TEX); Mpio. General Zaragoza: Aramberri-El Salitre, 1325 m, 26 Oct 1993, *G.B. Hinton 23766* (ANSM, TEX); La Joya, Cuesta Blanca, approximately 15 km S of Aramberri on road towards Gral. Zaragoza, 1345m, 29 Jul 1998, *M.A. Carranza Pérez & J. Valdés-Reyna C.-2981* (ANSM).

LEAF ANATOMY

Cross-sectional leaf blade anatomy was determined from hand sections of fresh field collected material (*Valdés-Reyna & Carranza Pérez 2560*) on temporary slides. The sections were stained in 0.05% toluidine blue. A diagrammatic cross-section was made with the aid of a camera lucida (Fig. 2).

The blades (Fig. 2) are typically kranz-C_4, NAD-me (nicotinamide adenine dinucleotide co-factor malic enzyme)-like in Hattersley and Watson's (1992) sense with tightly radiate arranged chlorenchyma and XyMS+ (presence of cells between the metaxylem vessel elements and laterally adjacent chlorenchymatous tissue, see also Hattersley and Watson 1976). The lamina are flat or conduplicate with primary and secondary vascular bundles about the same size. The primary vascular bundles are well differentiated into xylem with metaxylem, phloem, and a double bundle sheath (mestome and parenchyma bundle sheath). The phloem tissue is irregularly sclerosed. The ribs are flattened with angled sides (rectangular) and the furrows are 1/5 to 1/2 as deep as the width of the blade adaxially and usually less than 1/5 as deep abaxially. The medium vascular bundle structure consists of a simple keel with only a single primary vascular bundle. Per blade there are 9–15 primary vascular bundles and 16–24 secondary vascular bundles. There is one or two secondary or tertiary vascular bundles placed between each primary vascular bundle. All vascular bundles are situated in the median layer

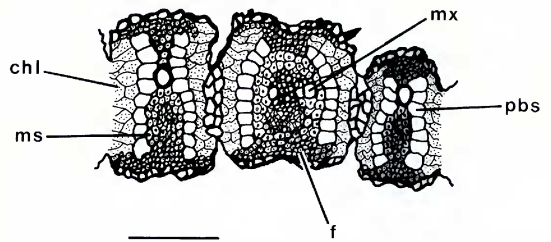

Fig. 2. Leaf blade cross section of a primary vascular bundle (center) and two secondary/tertiary vascular bundles of *Muhlenbergia jaime-hintonii (Valdés-Reyna & Carranza Pérez 2560)*. Scale bar = 25 (m; chl = chlorenchyma tissue; f = sclerenchyma fibers; ms = mestome sheath; mx = metaxylem vessel; pbs = parenchyma bundle sheath.

of the blade and are rectangular in outline. The xylem of the primary vascular bundles contains two wide metaxylem vessels that are about the same size as the parenchyma bundle sheath cells. The mestome, or inner sheath, is always present in the vascular bundles surrounding the xylem and phloem. The mestome is composed of small cells with thick walls and in primary, secondary and tertiary bundles it is interrupted abaxially and adaxially by sclerenchyma fibers forming a girder. The parenchyma bundle sheath, or outer layer, contains large, thin walled cells that are interrupted by the abaxial and adaxial sclerenchyma girder in the primary, secondary, and tertiary bundles. Chlorenchyma cells radiate just outside the parenchyma bundle sheath cells and are interrupted by a column of colorless cells forming a tightly radiate arrangement (NAD-me-like). Five to eight rows of sclerenchyma fibers form the abaxial and adaxial girders which are wide near the epidermis and narrow toward the vascular bundle. A few fibers form a rectangular to round cap along the margin of blade. Thick-walled colorless cells form a continuous column separating each vascular unit, these are not differentiated into bulliform cells.

DISCUSSION

The new species seems most closely allied to species of subgenus *Podosemum*, section *Epicampes* since it has culms with compressed keeled bases, conduplicate blades, primary and secondary vascular bundles both about the same size with sclerosed phloem, and shallow adaxial furrows (Peterson, in press; Peterson & Herrera-Arrieta, in review). *Muhlenbergia jaime-hintonii* differs from *M. emersleyi* and *M. pubigluma* (see Table 1) by quite a few characteris

TABLE 1. Salient features comparing *Muhlenbergia jaime-hintonii* with *M. emersleyi* and *M. pubigluma*.

Characters	*M. jaime-hintonii*	*M. emersleyi*	*M. pubigluma*
Shoot initiation	extravaginal	intravaginal	intravaginal
Rhizomes	short-leafy	absent	short-non leafy
Culm height	44–82 cm	100–150(–200) cm	75–125 cm
Ligule length (mid-culm)	0.4–1 mm	10–25 mm	5–13 mm
Ligule apex	truncate, ciliolate	acuminate, lacerate	acuminate, lacerate
Inflorescence 1° branch length	0.5–6.5 cm	(1–)9–17 cm	4–5 cm
Spikelet length	1.5–2.1 mm	2.2–3.2 mm	2.5–3.5 mm
Glume length	0.7–1.2 mm	2.2–3.2 mm	2.5–3.5 mm
Glume surface	glabrous	glabrous	pubescent
Lemma length	1.5–2.0 mm	2–3 mm	2.9–3.1 mm
Lemma veins	faintly 3(1)-veined	prominently 3-veined	faintly 3-veined
Lemma awn	absent	present or absent	present
Palea length	1.5–2.0 mm	1.8–2.9 mm	2.3–3.3 mm
Anther length	0.8–1.0 mm	1.2–1.6 mm	1.4–1.8 mm

tics, most notably: extravaginal shoot initiation, the presence of short-leafy rhizomes, short ligules (0.5–1 mm long) with a truncate and ciliolate apex, spikelets ranging from 1.5–2.1 mm long, short glumes (0.7–1.2 mm long) that are glabrous, short lemmas (1.5–2.0 mm long) that are faintly 3(1)-veined, short paleas (1.5–2.0 mm long), and short anthers (0.8–1.0 mm long). *Muhlenbergia distans* Swallen is also morphologically similar to *M. jaime-hintonii* but differs by having longer ligules (usually 5–10 mm long) that are firm below, longer spikelets (2.7–3.6 mm long), and short-awned (the awn 1.5–5 mm long) lemmas (Soderstrom 1967). The closest sister to *M. jaime-hintonii* appears to be *M. pubigluma* since they both share several characteristics, such as: densely white pubescence below the basal nodes, short-leafy rhizomes, reddish-gray spikelets, faintly 3-veined lemmas that are pubescent to villous on the lower 1/2 to 3/4, and simple keels (compound keels are the predominant character state in sect. *Epicampes*). In addition, *Muhlenbergia pubigluma* and *M. jaimie-hintonii* appear to be sympatric since the former species is known to occur just 10 km west of Aramberri between La Escondida and La Soledad [*A.A. Beetle M-406* (UC, US!)], and again west of Doctor Arroyo, approximately 60 km southwest of Zaragoza [*Shreve & Tinkham 9651* (GH)].

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